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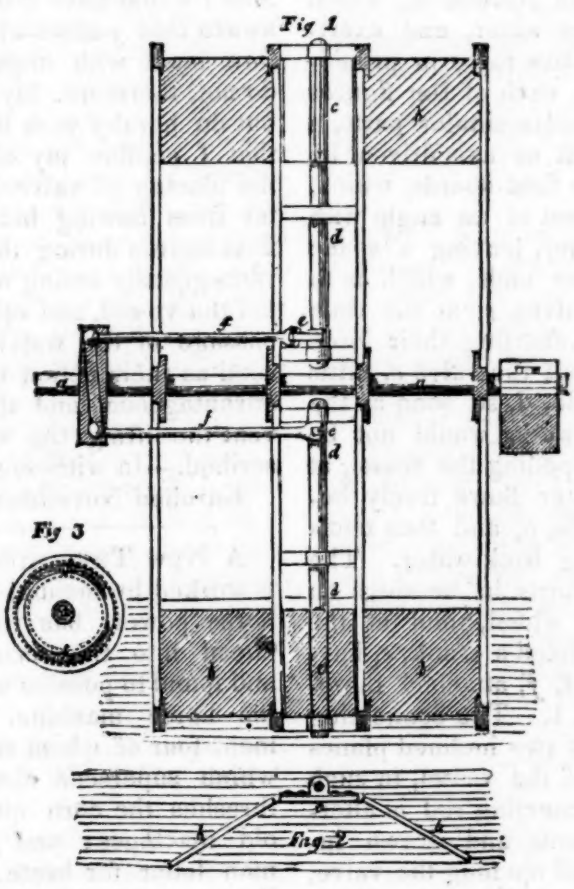
CARTER'S IMPROVED PADDLE-WHEEL.



Specification of the Patent granted to* GEORGE CARTER, *of Mottingham, in the County of Kent, Gentleman, for certain Improvements in Paddle-Wheels. —Sealed June 1, 1833.

To all to whom these presents shall come, &c. &c.—*Now know ye*, that in compliance with the said proviso, I, the said George Carter, do hereby declare the nature of my said invention, and the manner in which the same is to be performed, are fully described and ascertained in and by the following description thereof, reference being had to the drawing hereunto annexed, and to the figures and letters marked thereon (that is to say):

My invention consists of certain valves added to the float-boards of paddle-wheels, whereby the water against which such float-boards are acting is permitted to flow through, so soon as the float-boards would no longer be acting advantageously in propelling the vessel, and at the same time the water will not be lifted by the float-boards as they leave the water, and thus the surge caused by the back-water will be in a great measure avoided. But in order that my invention may be most fully described and understood, I

will describe the drawing hereunto annexed.

Fig. 1 shows an edge view of part of a paddle-wheel constructed according to my invention, there being only two sets of float-boards shown; but as the arrangement of the parts are similar to each set of float-boards, the invention will readily be understood by a competent mechanic.

Fig. 2 represents the plan of one set of float-boards, together with the valve between them, in the position at which they are when under water, and exerting their most effective force in propelling the vessel. In each of the figures the same letters indicate similar parts, *a* being the main shaft or axis driven by the engine; *b*, *b*, are float-boards, which, it will be seen, are set at an angle with respect to each other, leaving a space between the two inner ends, which is to be closed by the valves, *c*, at the time the float-boards are exerting their force against the water; but the valve *c*, turns on the axis or spindle, *d*, so soon as the further holding the water would not be advantageous in propelling the vessel, at which time the water flows freely between the float-boards, *b*, and thus tends to prevent the lifting back-water. The spindle or axis, *d*, turns in bearings on the framing of the wheel, and at the other end there is affixed a crank, *e*, having a connecting rod, *f*, attached thereto, as shown in fig. 1. The connecting rod, *f*, is acted on by two inclined planes affixed to the side of the vessel, in such manner that the connecting rod is alternately forced outwards and drawn inwards for closing and opening the valve, *c*. These two inclined planes are shown separately in fig. 3.

Having now described the nature of my invention, and the manner of combining the various parts, I will describe the manner of their action. I will suppose a paddle-wheel constructed, having any determined number of sets of float-boards, fitted and arranged as above described. It will be evident, that motion being communicated to the same by the main shaft, *a*, the valves, *c*, will successively be closed by the connecting rods, *f*, rising up the lower inclined plane, and will be kept close till it arrives to the end of the plane, when it will pass over the upper inclined plane, by which means the connecting rod will be drawn inwards towards the vessels, which will turn the valve, *c*, edgewise, and thus no longer prevent the water passing between the float-boards. I would observe, that although I have here described the valves, *c*, as turning on axes, yet it will be evident that in place thereof the same may be caused to slide up and down; nor do I confine myself to the precise arrangement of parts for turning the valves. And I would have it understood that I am aware that paddle-wheels have been before made with angular float-boards; I do not, therefore, lay any claim thereto, but do hereby wish it to be understood that I confine my claim of invention to the placing of valves, *c*, to stop the water from flowing between such angular float-boards during the time they are advantageously acting on the water to propel the vessel, and opening a way for the passage of the water between them so soon as their action would not be longer advantageous, and thus tending to prevent the lifting the water as above described.—In witness whereof, &c.

Enrolled November 30, 1833.

A New Threshing Machine, which is worked by manual labor, instead of by horse power, has recently been introduced into this county from Norfolk, and found to possess all the advantages of the horse machine. It employs eight men, four of whom turn two windlasses, which supersede the horse wheel; it threshes the corn quite as clean as the old machines; and in substituting human labor for brute power, it obviates the powerful objection to which the former improvement was obnoxious, of diminishing the employment of a redundant population.—[Stamford Mercury.]

Influence of Color on Heat.—Sir E. Home made experiments, which showed that the *scorching* effects on the skin, which takes place by the sun's rays through semi-transparent white cloth or linen, is prevented by the absorptive power of black cloth; or, again, that it strikes through the transparent skin of the white, but is absorbed by that of the negro—[Prof. Powell, Ed. Philosophical Journal.]

UNDULATING RAILWAYS.—This subject seems to attract the attention of engineers in this country as well as in England. It is in our opinion a subject of importance, and we hope to see thoroughly tested.

[From the American Railroad Journal.]

SIR,—In a former communication upon the subject of "Undulating Railways," (see Railroad Journal, vol. iii., p. 130,) were offered some strictures confined entirely to the experiments made by Mr. Badnall, upon the Liverpool and Manchester railway, intended to evince that the inferences drawn from those experiments were erroneous and absurd. In that paper, too, was hinted the probability that this projector was deceived by preconceived theoretical notions, believing that his delusion arose in drawing general conclusions from instances which were practically unsusceptible of any useful application in railway economy.

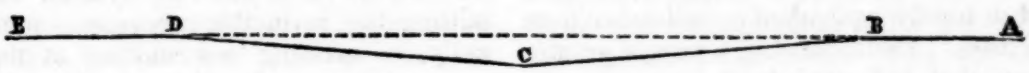
The subject is renewed with reluctance; but, professionally, as credenda of the engineer, as well as in view of a due estimation of the system in other respects, it may be proper. In so doing, it is now proposed to take a wider survey of its merits—a survey embracing the feasibility of the general principle of "undulating railways," *upon the plan of Mr. Badnall;* for every engineer understands that, to a greater or less extent, undulations exist upon almost every railway, and are indispensable, while the present terrene distribution of hill and valley endures; that, in this way, to surmount acclivities and obstacles, that by canals would be quite infeasible, is, indeed, one of their chief characteristics—one which, in a majority of instances, insures the system of railways' pre-eminence.

Before proceeding to the merits of the question, it will be proper to premise dynamical theorems, by means of which general comparisons of results may be instituted. The two which follow, dependent upon the laws of forces, will suffice for this purpose.

$$s = \varphi t + \tfrac{1}{2}gt^2 \left| \overline{\mp q + \mu - m}. \right. \quad (1.)$$

$$v = \varphi + gt \cdot \left| \overline{\mp q + \mu - m}. \right. \quad (2.)$$

In which φ = velocity of projection; v = velocity at the end of any time; t, during which the space, s, has been passed over; q = sine of inclination of plane, whereon any body, as a car, moves; μ = any constant motive force; m = that portion of resistance from friction which is constant—the two latter quantities being each compared with gravity taken as unity; g = the velocity acquired by a body at the earth's surface, urged by the force of gravity, at the end of the first second; and the compound expression $\mp q + \mu - m$ = *resultant* of all constant forces which influence its motion.



Take now the profile A, B, C, D, E, &c., having an undulation B, C, D, and because, with locomotive power, grades steeper than 50 feet to the mile, or thereabouts, are inadmissible, the utmost practical limit for g may be placed at ·01,* which make the common sine of inclination of the planes BC, CD. Take further the lengths of the planes equal: their altitudes will then be equal, and BD in the same horizontal plane.

In the first instance, *supposing we have no force but that of gravity*, the following effects would result to a body placed at the summit of the plane CB.

The sine of inclination being greater than the known value of friction, the body will roll down BC; but in consequence of the constant retardative influence of friction, its momentum at C will not equal that due gravitation—it will not therefore suffice to elevate it up the plane CD. Further, because friction continues its influ-

* Thus: the gross load of a train being supposed 40 tons, and its engine 6 tons, and 3-5ths of the weight of the engine upon the drivers—then 3-5ths of 6 = 3.6 tons, or 8,064 lbs., will be the absolute weight insistent upon them. Further, taking the mean adhesion at the liberal estimate of 1-10th, there results, for the absolute value of the adhesion of the peripheries, 806 4-10 lbs. Its force of traction cannot exceed this amount.

Now 40 tons = 89,600 lbs.; consequently, the force of traction due gravity alone, upon a grade whose inclination is ·01, is 896 lbs.—about 1-9 greater than the adhesion, without estimating resistance from friction. The above is then quite as great as would be admissible.

ence up CD, the distance it would otherwise ascend upon that plane will be still farther diminished.

Without the application of a *motive force*, it is, then, *impossible to attain any useful result*, even if it were possible to concatenate a series of counter-planes, each consecutive pair, at least, having a common altitude. Yet this would be the τὸκαλον of the "undulating railway."

In gravity, consequently, a motive force, at least equivalent to friction, *must* be advened *before it would be even possible* to elevate the body up the plane CD to D. If this be done, the performance would be infinitely in favor of the inclined profile, because, the motive force being a bare countervail to friction, no performance could result upon the level: that is, *it would be thus, if precisely at the point* D *a declivity commenced, having a correspondent counter-plane, and so on between the termini of the road.*

But this is out of the question. Such a structure is entirely visionary. Occasionally in selecting the site for a railway, a conformation of country presents itself where a pair of counter-planes *could* be constructed; but from the invincible nature of things, the intermedial parts *must have different positions;* and *power*, unless adapted to meet and overcome the resistances they offer, would be entirely ineffectual.

Secondly, then, it appears, no useful result can flow from the employment of a force barely equivalent to resistance from friction. Consequently, a power greater than that indicated must be employed; and by the same reasoning, it appears that such increment of power *must, at a minimum, be adequate to traverse all other portions of a line of railway.*

It is frequently necessary to submit to resistances requiring a motive force of ·015. Engines, whose powers do not equal or transcend this force, would have little efficiency upon any general lines of railway that are or may be constructed; the geological features of the globe offering insurmountable impediments to a materially different result.

Thus constrained to employ a motive force equal or near this value, it is highly pertinent to the inquiry to discover what modification results therefrom: the subjoined will be among the most material.

1. It has been shown that, when the motive force is barely equivalent to friction, the imparity between the performance upon the level and upon the inclinations is limitless: reciprocally, when the motive force becomes infinite, the performance upon either would be equal. It follows thence, that, between these extremes, as the motive force is enhanced, the *performances approach equality.* An approach, at least, towards equality of performance, ought, then, to obtain in consequence of the value of μ, *necessarily*, standing comparatively high.

2. The resistance or assistance from gravity being directly as q, since a deviation from the assigned limit ought, for reasons already advanced, to be made in diminution of that value, this would obviously further tend to approximate the performances at points where that limit is unattainable.

These considerations alone place the impropriety of general conclusions, from a particular case, in a light to be justly appreciated.

Still there is another consideration, of the highest import to a fair estimation of the principle, as yet untouched.

It has all along been implied that the body at B is at rest; in that case, too, it would cease to move when it should have arrived at D. But this, again, is clearly inadmissible. Alternations of rest and motion in the midst of an unobstructed way are subversive of the very system. Admitting the invincible necessity, practically, of arriving and starting at these points with considerable projectile velocity, it is evident that its effects are substantially the same with the first mentioned—that, as it increases, it favors the level. This, then, is another weighty reason for the disparity of the ratio of performances to vanish.

With these preliminaries we proceed to a comparison of instances. Suppose there were two planes disposed, as in the diagram, whose common sine was ·01, and their lengths 1000 feet; and, further, suppose the motive force, μ, just sufficient to preserve the dynamical equilibrium *up* the planes—*i. e.*, rating friction at $\frac{1}{223}$, or ·0044, to ·0144. If, moreover, the projectile velocity at the head of the planes be estimated at the moderate speed, for locomotive power, of 20 feet the se-

cond, (nearly 13 miles the hour,) we shall have sound practical values for φ, q, m, μ; and by the theorems, we at once obtain the comparative performances of two similar trains upon the inclinations, and upon the level: thus—

Upon the inclinations:

Time of descent down B C is, (by theorem 1,) 32.75 seconds.

Terminal velocity is, (by theorem 2,) 41.07 feet per second.

Time of traversing both planes is, 65.50 seconds.

Which gives a mean velocity of 30.54 feet the second.

Terminal velocity, (same as projectile,) 20 feet the second.

Upon the level:

Time same as upon inclinations, 65.5 seconds.

Distance traversed in that time is, (theo. 1, making $q = o$,) 2,000 feet.

The mean velocity is then *the same*, 30.54 feet the second.

The terminal velocity is, (theo. 2, making $q = o$,) 29.75 ft. the second.

On comparison of the *mean velocities* for both systems, can the conclusion be resisted, that—even when only that portion of resistance which is constant is accounted—*there is no gain by the system of counter-planes?* and that, when the *final velocities* are considered, *there is a decisive loss by that plan*, seeing that they stand as 29.75 : 20, nearly $\frac{1}{3}$ in favor of the level? Were the velocities to become uniform, after the horal velocity of $26\frac{1}{2}$ miles the hour had been attained, the effect of the latter would be thus: at the instant of absolute time this took place, ($65\frac{1}{2}$ seconds after passing D,) with the engine which had run upon the inclinations, its fellow, which had run upon the level throughout, would be 487 feet in advance; and so on for every similar subsequent portion of the railroad.

Should the conditions prescribed obtain in practice, we may assert, in general, the inferiority of the "undulating system" of railways.

Reasons for assigning ·01, as about the limit for inclinations, upon that plan, have already been given. In respect to length of plane, safety alone, (to apply the convoy, or abate the motive force, is bane to the principle, because acceleration, its sole basis, is thereby checked,) indicates the length assigned above, as near the practical limit wherever the two plans may come in competition: for, in consequence of acceleration, the terminal velocities would be greater than are consistent with safety. On longer planes, by reason of lateral friction, the resistance of the atmosphere, velocity becoming uniform, &c., aside from danger, the effects of acceleration disappear: hence, the case chosen will be near actual limits for all restraints, while, for that reason, it is the most favorable to the "undulating system." The cases falling within these limits, will, of course, be still more opposed to the inclined road.

In what precedes, that portion of resistance which is constant has alone been regarded. There are, however, other sources very material to a due estimation of the system—as, the atmosphere—the retardation from centrifugal force on curvatures—and the casual infringement of the flanges of wheels against the rails. Upon long planes the latter operates; indeed, upon all inclined planes, it operates, beyond what obtains on levels, very sensibly in opposing the basis of the system—acceleration.

The exponent of the law of increase of resistance from the atmosphere, at varying velocities, being greater than unity, in all accelerated motions its mean effect will stand far higher upon the inclinations than upon the horizontal way; and therefore against inclinations. The latter remark applies as forcibly to resistances from curvatures.

We should err, then, most egregiously, if neglecting all those highly material resistances, *results as favorable to inclinations* as our theorems give were anticipated in actual experiment. Of this, look where we may, there will not be found any more striking or decisive confirmation than the experiments conducted by Mr. Badnall upon the Liverpool road. *They indicate an inferiority by the counter-plane system*, varying from $\frac{1}{3}$ to nearly $\frac{1}{2}$. [Vide Railr. J., vol. iii. p. 130, col. 3.] Reasoning *a priori* from the known laws of mechanics, leads thus to results perfectly coincident with experiment: the *larger diminution* of effect in these experiments being satisfactorily accounted for

in the exclusion, from our theorems, of the material resistances just recited.

All delusion, it would seem, then, in regard to the demerits of the "undulating railway," consists in the hallucination of inferring general practical results from a particular case, which can only exist in theory. It is a little singular that a gentleman, of the intellectual acumen the reasserter of the old fallacy of undulation has evinced, in many communications to the public upon the subject, should, despite his own experiments, commit so obvious and unphilosophical an oversight.

In our computations, it may be objected no allowance has been made for diminution of friction upon inclinations. True; but even in theory, the difference is entirely insignificant; for, within the limits assigned to the inclinations, the ratio of *cosine to radius* is almost precisely a ratio of equality—and it is in that ratio that it can alone be lessened. In a practical view, we opine, that even this immaterial quantity disappears, in consequence of the bearing surface being diminished by the larger weight being thrown upon one pair of wheels.

Perhaps exceptions may also be taken to the supposition that the planes are of equal altitudes. The obvious rejoinder is, the inclinations are inferior in the case of a common altitude, which is that most favorable to the plan; therefore, *a fortiori*, &c.

The expectation of realizing *economy of power*, with its pecuniary implications, and public and private benefits, appears, upon overlooking the whole grounds we have taken, to be entirely groundless.

There are, however, still other objections yet unenumerated. Besides inferiority in point of power and danger from high speeds, it would be highly destructive to machinery; all intermissive irregular motions are unfavorable to its duration, safety, and economy: especially does this remark apply to the delicate, nicely adjusted machinery of railways.

The road-way would depreciate more rapidly in consequence of the larger weight being thrown upon a single pair of wheels.

Concussions between the advance and rear of a train of cars, when passing the apex of the planes, could not be obviated, even though it were rounded to the arc of a circle, or thougn the entire inclinations were arcs of the circle, or any other curve. Both danger and damage would thence ensue.

The system and locomotive power mutually antagonize; at the high speeds inexorably required by the plan, the elasticity of steam would be largely reduced —a circumstance adverse to acceleration, &c.

The only entity, in the shape of an advantage, the system presents, in contravention of a series of disadvanges—either of which would go far towards countervailing any benefit of this kind—it appears, consists in economy of embankment; and, possibly, at some points, of excavation at those points where the plans come in competition. There is little danger of the skilful, scientific engineer, being deluded by a purblind economy in this respect, where adequate advantages are not clearly secured.

W. M. Cushman, C. E.

Albany, December 22d, 1834.

Steam Engine.—In March, 1833, the Governor General of India received the following curious letter from Shewloux Roy, Gomashta of Luckmeecund and Radhakissen, who appears to have been touched with a laudable desire to enlighten the ignorance of his neighbors.

"My lord; Our Seth Munne Ram has heard with astonishment that an iron boat has been sent out from England, which can swim, and is capable of being navigated from Calcutta to Benares in eight days, against the stream. He desires to know how such things can be; he has directed us to make particular inquiries into such an unheard-of piece of mechanism, and to ascertain if it be true that the English perform such pieces of necromancy through the agency of those Jins, or devils, who, in the early ages of the world, were turned into smoke and put into pots by the learned among mankind, and taken out to work for their masters as required. Now, as we know the real truth of these matters, which those of Gwalior do not, we hope, especially as it will be pleasing to the Gwalior government, that a copy or epitome of the iron steamboat may be given to us, that we may send it to Gwalior, with an explanation, showing how such things, incredible to others, can exist through the agency of the British knowledge and science."

[From the London Mechanics' Magazine.]

*First Essay, preliminary to the series of Reports on the Progress of the Useful Arts, ordered by the Society of Arts for Scotland.**

When we contrast the conditions of man at remote periods of his history, we perceive an immense disparity between his attainments; and this disparity becomes the more remarkable when we consider, that of all the species of animals which exist on the surface of the earth, man alone is liable to this fluctuation.

Each individual animal attains the complete use of all its faculties; and this, even though the successive generations of the tribe be separated from each other by a long lapse of time. With many animals nothing in the shape of instruction is needed. The insect tribes at once proceed in the course that nature has designed for them. No sooner does the egg burst than the larva sets itself about the business of its existence; it swims expertly through the water, and seeks out its appropriate food. Led by an unerring instinct, it approaches the surface of the pool or climbs the stalk of some aquatic plant, and, ere the spectator has time to mark the change, it launches off in an untried element, and is undistinguished among the thousands that have had the long experience of an hour. Some again wake to life in the tough bark, and eat their vermicular way through the sapwood; till, when the metamorphosis draws near, they seek the outer rind, cut it with altered mandibles, elevate their elytra, unfold from beneath them their delicate wings, and use with the utmost ease their newly-acquired powers and senses.

Ascend, as we call it, in the scale of existence, and the elements of tuition appear. The birds, for the most part, educate their young; they lead them by short flights to seek their food, and only abandon them after their powers are fully developed. The same remarks hold of many of the quadrupeds. In all cases, however, the powers arrived at are nearly the same with each individual of a species. But when we reach the top of the scale, how different! The young of the human species receives not merely that tuition which is common to all the mammalia, but also a distinct kind of education, which conveys the fruits of the experience of all the preceding generations. Man lives to add to that experience, and though his physical powers reach to their full development, the entire man knows nothing of maturity. Powers of which our ancestors were ignorant, are now wielded by us, while we, in our turn, may be opening the way for other processes to be employed by our descendants.

The burrowing bee still uses the same instrument to pierce the downright shaft, and to cluster round it the beautifully smoothed cells. Still she selects the hard beaten soil, whence the wind may sweep the dust that otherwise would betray her labours. The sand-spider still uses the same cement to form the walls of her retreat, and to weave her branchy net. But man is found at one time burying himself in the ground, at another tearing the rocks asunder to rear the magnificent palace. Here he draws his subsistence from the ocean, there he cultivates the ground; here he clothes himself in the skin of the wild beast, there he weaves the delicate web, and prides himself on the sleekiness of his coat.

With man there is no permanence. Every thing is changing, and each season adds to his powers and comfort. He seems to possess an endless variety of appetites, that are only called into action as opportunity offers for their gratification; there seems to lurk within him an immense variety of powers, of which only a few are called into active use by any single individual. Among the animals, the history of an individual is almost the history of the tribe; but the story of the life of man is ever changing; and the mode of living of one nation appears incredible to another.

In the present paper I intend to take a rapid view of the general nature of those processes by which man gradually changes his condition; to examine into their tendencies, whether for or against the increase of human happiness; and to glance at the method of encouraging their development.

Man is possessed of a highly muscular and pliable form, capable of enduring long continued and vigorous exertion; yet the tenderness of his limbs prohibits the direct employment of his powers. The animals are invariably supplied with instruments fit for the various operations they have to perform. The bee has the proboscis wherewith to reach the bottom of the nectary; the burrowing animals have claws for dig-

* Read before the Society, 5th Sept. 1834.

ging the earth, and the beasts of prey for tearing their food. But man works entirely by *tools*. Does he wish to throw the stone, he uses the sling; the spade enables him to dig the ground. The capability of employing inanimate matter, of making it, as it were, a part of himself, is almost peculiar to man; only very faint traces of that power are to be perceived among the animal tribes; in man it is completely developed; for, on reflection, we will at once perceive that almost every operation which we perform, is done by the assistance of tools of one kind or another. When we walk we protect our feet against the sharpness of the road, and when we attempt to change the form of any hard body, we arm our hands with something harder still.

It is then not merely possible for man to employ tools in his operations; it is indispensable. His hands are admirably formed for the wielding of such tools; while with them alone he could neither dig the earth nor fashion the softest timber. Taken in the most general sense, then, the *arts* are eminently useful to our race. Some of them are necessary to our very existence.

Let us conceive man in his rudest stage, ignorant of every latent power, and using only his own limbs. View him falling before every attack of the lion, the tiger, or even of the wolf; and then fancy that some fortunate individual hurls the stone to crush his adversary. What rejoicings through the tribe! with what eagerness would they practice the new *art!* what honors would be heaped on its discoverer! Suppose then, that chance had revealed to them the nutritious qualities of some root; and that patiently they dug it with their fingers, till some one fatigued, perhaps tortured, with continued exertion, seizes the flat stone or the broken bough, and renders the operation at once more rapid and more agreeable. It is clear that the discovery of these simple tools, the *missile* and the *spade*, would increase the security and augment the power of the race; it is undeniable that with these assistants man would be happier and more comfortable than before. The labor expended in providing sustenance and defending life would be diminished, and more time would be allowed for the gratification of higher appetites. The spade, the sling, the club, or the bow, would begin to be ornamented, and man would delight himself in the symmetry and propriety of the ornaments.

On the first glance one might allow that the same principle would extend itself to every subsequent discovery, and that every means of enabling man to produce a greater effect than he could have produced before with the same labor, must augment the enjoyments of the race. Such a general statement, however, must be received with the utmost caution, since the circumstances of human society are so varied that some of them may even happen to convert the benefit that otherwise would have accrued from such improvements, into an actual evil.

So long as each individual family provide for their own wants, the principle has undoubted scope; but when different individuals have betaken themselves to different crafts, and when the community depends on the barter of good offices, an improvement in any particular art may be highly injurious to some one of the various classes. It seems clear that every improvement is ultimately beneficial to the whole commonwealth; but it is impossible to shut our eyes to the misery which is, at times, inflicted on individuals. In the present highly artificial state of society, these sinister effects are unfortunately too frequent and too severe, and it is no easy matter for the sufferers to reason themselves into the belief that what has been productive of their own ruin can at all be beneficial to the community.

The rapidity with which changes in the modes of operating are now introduced; and the competition which exists, not merely between the fabricators of the same material, but between those of different kinds of commodities, give an unprecedented variability to the distribution of comforts and enjoyments; so that when contemplating the advantage of some new process, one shrinks from a view of the mass of misery which its introduction may occasion. Many arts are acquired only after long practice; the power of producing certain effects with rapidity and precision, forms the capital in trade of many industrious men. But when some new mode is discovered, that capital is completely annihilated, and the unemployed workman can hardly look with any thing but jealousy on the innovation. In the old method of manufacturing paper, great dexterity was required in lifting a sheet, so that it might be of equal thickness throughout, as well as similar to others of the ream. Good workmen were scarce, and received high wages; but when the

thickness came to be regulated by machinery, these workmen were either thrown idle, or compelled to betake themselves to some inferior employment; a number, indeed, readily found employment in the continental paper-work, yet still the distress must have been great among that class of men. The members of that craft, however, formed a small proportion of the population, so that the elastic constitution of human society has already accommodated itself to the new circumstances. But the hand-loom weavers have suffered more severely and for a greater length of time; their number was more considerable, and of course they experienced a greater difficulty in finding a new employment; and the circumstance, that the finer and more expensive looms were often their own property, has perhaps rendered them unwilling to desert their old employment.

Painful though the contemplation of such sufferings may be to the philanthropist, it is impossible that he can disapprove of the cause. A small class of the present generation indeed suffers, but a benefit is conferred not only on the population at present existing, but on the whole future generations of the race. The distress occasioned by the substitution of steam for hand-spinning was intense; that, however, has passed away, and the effect now is, that the peasant is able to purchase fabrics which, a hundred years ago, would have excited envy among the wealthy. The machines for forming the various parts of watches, threw, no doubt, out of employment for a time, the handicraftsmen, but a watch is not now considered as worthy the attention of a Rupert. I might cite examples without number, for in almost every instance, a decided improvement has been accompanied by temporary inconvenience, while the permanent effects have invariably been an increase in the number of hands employed, and an advance in the general condition of society.

There are, however, some exceptions. There have been improvements beneficial throughout to all parties concerned. Such are those improvements in agriculture which augment the fertility of the soil; or those in mechanics which have rendered practicable what before was impracticable. Mines and quarries which could not have been profitably wrought, had the water and the rubbish been removed by hand, have become at once productive on the application of water, wind, or steam. And remote pastures, whence the cattle could not be brought but at an expense almost exceeding their value, now regularly supply our cities. On such improvements the mind rests with unalloyed pleasure; not so when the improvement consists in the substitution of one process for another.

Since the distress of one class of workmen is often the effect of a general improvement, we might consider it fair that the community charge itself with the relief of the sufferers. The projectors of a canal, or of a railway, are taken bound to make up any loss that may be sustained by the trustees on the ordinary road; and it really appears that, with equal propriety, the inventor of some new process might be made liable for the damage thereby occasioned to those who practised the old ones. Such an enactment, however, imagining it capable of being put into execution, would crush every innovation, and produce that stagnation which we see in China; it would prevent even the changes of fashion, and the shawl-weavers would at present be prosecuting actions against all the weavers of printed crape. Since distress as serious as that produced by any improvement, is often occasioned by the caprice of the leader of fashion, with as much propriety would we define the form and material of dress as restrain the most perfect freedom in the progress of discovery. Relief need not be sought from legal enactments; yet the case is a hard one, and demands alleviation.

The principal source of inconvenience lies in the difficulty with which the workman acquires a new craft. Those workmen who are accustomed to a great variety of processes, and to a frequent change of tool, are almost secure; but the situation of those who only know one process is deplorable. He who has never gone beyond the fixing of a pin's head, or the sharpening of its point, would be rendered completely destitute by the discovery of a method of forming a pin by machinery; but the engine-maker has never felt any inconvenience from the general introduction of slide-rests and planing-engines. The philanthropist, then, should rejoice to see the workman, not contented with a single occupation, render himself master of several crafts. A great deal of stress has been laid on what is called the division of labor. Long continued practice, in a single art, will indeed

give at length great expertness; yet I question if one accustomed to vary his work, would not much sooner reach proficiency. In passing from the grinding of knives to the grinding of scissors, some little time indeed is lost, and a few minutes elapse ere the workman's hand has got, as he calls it, into the way. But this is only at first—after he has had frequent occasion to make such transitions, his mind has stored up the little incidents to be attended to, and no more time is needed at a change of employment, than is necessary every morning at the beginning of his day's labor. Not only would this custom of acquiring several trades give security to the workmen, but it would at the same time greatly facilitate the march of improvement. An interchange of methods and ideas would at once take place, and each craft would adopt some of the methods practised by another. The wright, instead of forcing an obstinate screw-nail, would use the chisel of the die-cutter to dress the destroyed cut—thousands of applications would be made of principles that otherwise would never be brought home to the attention of the artisan.

If we run over the history of the great improvements that have been made, we will find that almost all of them have come from the minds of those who have attended to a considerable variety of subjects. The great improver of the steam-engine was not an engine-maker, nor did the contrivance of the stocking-frame come from one tired with the monotonous manipulation; and I question much if any of the users of the distaff ever entertained the idea that it could be dispensed with. The method of co-ordinates of the higher geometricians, after improving astronomy and geodetics, descended to plan the slide-rest, and the planing-engine; and had no intercourse existed between the art of working iron, and the abstruse science of applied algebra, we might yet have wanted those excellent instruments. An extensive knowledge, in fact, of what can be done with materials, is essential to the contrivance of new modes of operating; or even necessary to the successful repetition of operations already known.

From the general cultivation of the minds of the workmen, we might therefore expect an increase to the stability of human society, an improvement in the style of execution of the various manufactures, and a more fertile inventiveness. We are apt to imagine that the improvement of our manufactures goes on by starts, and that a few names only need be mentioned in their history. The course of improvement is indeed marked by a few more considerable steps; but beneath these, and concealed from the mere casual glance, there flows a calm but rapid current. Minute facts are communicated from one workman to another, and the craft proceeds by insensible gradations; the skill of the workman gradually advances, creates a taste in the consumer for a better article, and receives again from that improved taste a reflected stimulus. Unless we had workmen skilful to execute, our best arranged schemes would fall to the ground; and unless the artisan himself were able to appreciate the beauty of execution, we would be shocked, at every turn, by deformity and imperfection. But when the mason plies the mallet, he delights in contemplating the finished cornice, and not merely as we are apt to imagine, the prospect of gain, but also the anticipation of a higher enjoyment, cheers him through his toil. And perhaps the gratification of the architect himself is inferior to the delight felt by his better workmen, when they retire to contemplate the finished edifice.

While seeking the means for encouraging improvements in the arts, we must not then imagine that our only business is to reward the contriver of some important change. Of that task the anomalous patent laws have effectually relieved us. The principal part of our employment should be to render public each minute piece of detail, and to encourage the able workman to communicate the results of his experience. We should endeavor to improve his taste by the exhibition of finer specimens of workmanship, and to excite his emulation by rewarding superior merit. Variations almost insensible, in the modes of operating, lead to important changes in the character of the effects. Thus we attempt in vain to file a small surface flat while it is held firmly in the vice, yet the operation becomes easy when a small vibratory motion is allowed. Again, if we attempt to hone a penknife with the thumb toward the back of the blade, we soon produce a rounded edge, but on reversing the position of the blade, a thin edge is preserved. The turning-graver, when held in one position, makes criddled work; yet, when placed in another scarcely different, it produces a clean surface. The

spokeshaver, when used by a beginner, is apt to round the end of a piece of wood, but a very little deviation from the ruder way of holding it preserves the proper outline. Thousands of niceties such as these would form the workman's manual. Those workmen who have constantly resided in an isolated district, are often found ignorant of the simplest artifices of their craft; while those again who have had communication with numbers of their own trade, become, from that intercourse, expert operators. Keeping facts such as these in view, our Society should gladly receive the statements of the artisan, and should lend a willing ear to communications, though their subject might be of less importance than a substitute for steam. By rendering this a place where the workman might hear the different processes described, and the principles of them explained; where he might learn the cause of the advantages of one method over another, and the source of the imperfections of all operations, we would provide an inexhaustible fund of instruction for ourselves, and, at the same time, would give a powerful assistance to the progess of invention.

Those improvements which seem likely to produce a decided effect, and those inventions that have required the concurrence of great ingenuity and severe exertion, merit our peculiar attention; and considerable difference of opinion exists as to how we ought to proceed in our attempts at encouragement. We may either propose prizes for distinct objects, or may generally offer rewards for such improvements as appear best deserving of them. In the one way we attempt to lead the mind, in the other we only approve of what has been done. Of the first, we have had a notable example in the Parliamentary offer of a reward for a perpetual motion,—a reward, the hope of receiving which has led many ingenious men to ruin.* The last approaches as nearly as possible to the natural state of things, where a meritorious action works out its own reward. We have resolved on an amalgamation of the two, so as to combine all the advantages, but all the disadvantages too, of both. This course will be attended with one important result, that in a few years our own records will furnish us with data wherefrom to draw a decision; it will then be proper to return to this important subject.

That encouragement, however, which we can give aggregately is trifling in comparison with that which flows from our individual exertions. It is in the power of each to recommend a better article, or a more commodious instrument; and even though the newer commodity be a little more expensive than the old, it is the duty of every one to give the improved process a fair chance, in order to accelerate, as much as possible, the yet remote maturity of the human race. EDWARD SANG.

September 4, 1834.

* Is it perfectly correct to say that there has been any such "Parliamentary offer?" We apprehend not. There was a Parliamentary offer of a reward for the discovery of the longitude, that is, for the invention of the best possible time-keeper; and inasmuch as any perpetual motion must of necessity be uniform, to discover such a thing would have been to discover a measurer of time, that would have left the Harrises, the Mudges, and other chronometer improvers, completely in the shade. But to say that *therefore* the offer was actually one for the discovery of perpetual motion, is to say that Parliament offered a reward for attaining a *possible* object by *impossible* means. —ED. M. M.

Mr. Ballingall, in a new work on "the Mercantile Navy improved," proposes solid bottoms and caulked inner planking to render vessels water-proof, instead of the flimsy shell-work now in use. Sir Robert Seppings has introduced these improvements into the Navy. Mr. Ballingall says it would be an *annual saving of two thousand lives and one million sterling of property.* During the year 1833 alone, there were lost *six hundred and eighty* British merchantmen.—*Eng. Paper*

[For the Mechanics' Magazine.]

Specification of the Patent granted to GEORGE DUNCAN COOPER, *of the City of New-York, for the application of Gum Elastic sheets, or cloth sheets covered with Gum Elastic, to vessels and roofs of buildings, &c., to prevent their leaking, and to preserve the crews of vessels from the ill effects of dampness caused by the salting of vessels.*

Take Gum Elastic, commonly called Indian Rubber, dissolve it and run it into sheets one-quarter of an inch thick, and of such length and width as the owner or builder may elect, or import the sheets ready cast from Pava, the place where the gum elastic is produced, one inch of the sides and ends of the sheets to be only one-half the thickness of the other part of the sheets, or take cloth sheets covered thick on one or both sides with gum elastic.

The places to which these gum elastic sheets or cloth sheets covered with gum elastic are to be applied, are—

1st. Between the inner part of the ribs and the inner planking.

2d. Between the outward part of the ribs and the outward planking.

3d. Between the outward planking and the copper, in all or either of the above places.

4th. Between the deck beam and the deck planking.

The manner of putting on the sheets is as follows:—Tack one end of the sheet on the keel of the vessel, and have the sheets so wide as to cover three or four or more of the ribs; carry up the sheet as far as it will reach without stretching, and secure it slightly by tacks, then put on other sheets at the sides and end of the one already put on, letting the last sheets lap over the first one an inch; then with the dissolved gum elastic paste the sides and ends of the sheets together; when the dissolved gum becomes dry, the places thus united will be as firm and elastic as any other part of the sheet; continue thus putting on and uniting the sheets, until the whole of the bottom, sides, and stern are covered. Put on the plank; as the sheets are put on, the tacks may be taken out or left in; a strip of gum elastic may be placed between the edges of the planks, and be made to adhere to the sheets with the dissolved gum, this will obviate the necessity of caulking, and be less liable to wear and work out than oakum.

In putting the gum elastic sheets on in the hold, the same process is to be observed.

In putting on the sheets on the outward planking, tack the sheets lightly on the plank and unite them as above directed, then put on the copper, pulling out the tacks as the copper is put on.

Another and a better mode of applying the gum elastic sheets is as follows:—Cover the bottom, sides, and stern of the vessel with oak boards, one-half or three-quarters of an inch thick, planed smooth, on these boards put the sheets and unite them as above directed; *in this manner there will be a perfect unbroken sheet of gum elastic from the stem to the stern, and all round the vessel, and whichever way the vessel may strain and work, the gum elastic will stretch and work with it, and effectually exclude the water;* over the sheets put the plank. The same application to be made on the deck, viz.: first board the deck beams, then put on the gum elastic sheets or cloth sheets covered with gum elastic, and unite them with the dissolved gum, and then plank and caulk. As a still greater security, the hold of the vessel may be lined in the same way, that is to say—first boarded, then the sheets of gum elastic put on, and then planked and caulked. By putting the gum elastic sheets on in the hold, it will increase the safety of the vessel against loss from leaking; it will enable the timbers of vessels of war to be salted, and thereby prevent the dry rot, and will preserve the crew from sickness caused by dampness in salting the timbers, for no dampness can strike through the gum elastic into any part of the vessel. The boards, sheets, and planking of the hold to lap over the inner part of the deck beams a foot or more, so that any water that may get between the planks of the deck and the sheets, will run down between the ribs and not penetrate the hold. A frame can be made round the lower part of the pump, boarded first, then covered with gum elastic sheets and united to the sheets of the hold with the dissolved gum, and then planked and caulked; by this means should the outward works let in any water, it cannot reach the cargo, and any water that might find its way between the ribs could soon be pumped out; besides, the hold and pump thus secured, will prevent any part of the cargo if in bulk or store from reaching the bell and choking the pump.

In lining the hold, board first, then place the sheets on the boards and tack the ends of the sheets on the kelson, an inch higher than the upper side of the planks, then unite the sheets and put on the planks and drive them well home towards the kelson; the gum elastic thus placed between the kelson and the edge of the planks, will prevent the water from forcing its way into the hold between the kelson and the planks next the kelson.

Gum elastic sheets also to be put on the covers of the hatches and round the hatches. And gum elastic, cast for the purpose, to be put round the masts and pumps where they meet the deck.

In covering roofs of buildings, &c., the following mode is to be adopted:—On the rafters nail rough boards, on these boards put the gum elastic sheets or cloth sheets covered on one or both sides with gum elastic, and unite them with the dissolved

gum as heretofore directed. Over the sheets put shingles or slates, so that the roof of the building is not only water tight, but air tight. G. D. Cooper.

New-York, July 14, 1834.

N. B. Measures have been taken to obtain Patents in the European government.

G. D. C.

[For the Mechanics' Magazine.]

To cut holes through the floor of a mill, for belts to pass through to operate machines.

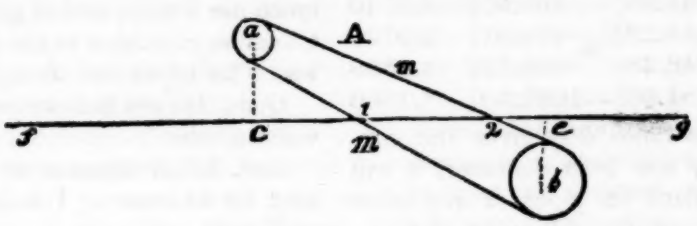
After having located the machine in its proper place, we will suppose the main pully to be fourteen inches diameter, and the drum that drives it two feet six inches diameter—the centre of the pully to be 32 inches from the floor above, and the drum 25 inches from the floor below.

Drop a plumb line from the centre of the pully to the floor, and bore a small hole through the floor—drop another plumb line from underside of floor to centre of drum, and take the horizontal distance from one to the other, which we will call ten feet.

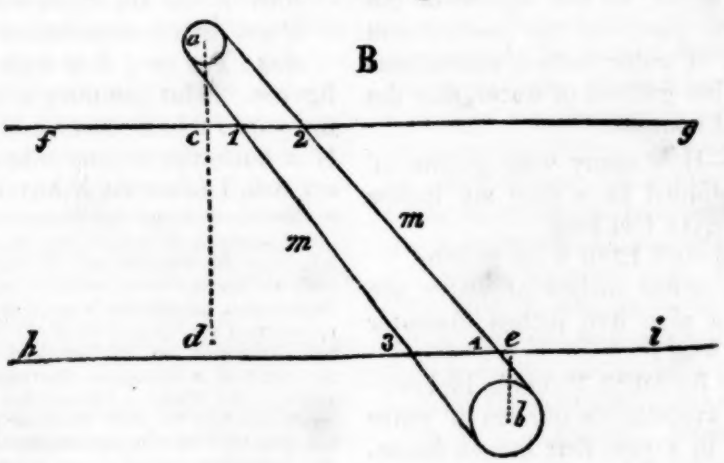
Then, for the first example, where there is but one floor between, we will first draw the line *f g* in any convenient place on the floor, or on paper which will represent the floor, and raise a perpendicular line on any convenient place as *c a*, (see A;) set off the distance 32 inches from *c* to *a*, around which describe a circle to represent the main pully; from *c* set off the horizontal distance 10 feet to *e*, and drop the perpendicular *e b;* from *e* set off the distance, 25 inches, and describe the drum = 30 inches; draw the lines *m m*, after which take the distance *c* 1, 2 *e*, and set on the floor from the plumb spots, set out the size of the holes, and cut them through to slant with the lines *m m*.

For the second example, drop the plumb lines as before, and continue on to the second floor, draw the lines *f g* and *h i*, to represent the two floors—set off 10 feet from *d* to *e* on *i*, and 25 inches from *e* to *b*, 32 inches from *c* to *a*—describe the pully and drum, and draw the lines *m m* as before—set off the distances *c* 1 *c* 2 from the plumb spot *c* on upper floor, and *d* 3 4 *e*, from the plumb spots *d* and *e* on lower floor, set out the holes, and cut them as directed above, with the slant of *m m*. If the belt runs much upon a slant, as in the first case, there should be an allowance made for the sag.

First Example.



Second Example.



It is very necessary that the above calculations should be well understood by every operator of machinery. Very many make a very haggling piece of work in cutting belt holes. I have seen holes cut a foot square or more, for a belt not more than three inches wide to pass through, and yet the belt would rub on one or the other side of the hole, all for the want of a practical knowledge of the principle as above laid down. A.

A table of the contents of a pipe one inch diameter for any required height from 1 *to* 200 *feet:*

Height.	Cubic in.	Avoir. oz.	Wine galls.
1 ft.	9.42	5.46	0.0407
2	18.85	10.92	.0816
3	28.27	16.38	.1224
4	37.70	21.85	.1632
5	47.12	27.31	.2040
6	56.55	32.77	.2423
7	65.97	38.23	.2848
8	75.40	43.69	.3264
9	84.82	49.16	.3671
10	94.25	54.62	.4080
20	188.49	109.24	.8160
30	282.74	163.86	1.2240
40	376.99	218.47	1.6300
50	471.24	273.09	2.0400
60	565.49	327.71	2.4480
70	659.73	382.33	2.8560
80	753.98	436.95	3.2640
90	848.23	491.57	3.6700
100	942.48	546.19	4.0800
200	1884.96	1092.38	8.1600

Although this table only gives the contents of a pipe one inch diameter, it will serve as a standard for pipes of any other size, by observing the following *Rule*:—Multiply the numbers found in the table against any height, by the square of the diameter of the pipe, and the product will be the number of cubic inches, avoirdupois ounces, and wine gallons of water, that the given pipe will contain.

Examples.—How many wine gallons of water are contained in a pipe six inches diameter and sixty feet long?

$24480 \times 36 = 88.1280$ wine gallons.

How many cubic inches of water are contained in a pipe five inches diameter and forty feet long?

$376.99 \times 5 \times 5 = 9424.75$ cubic inches.

How many avoirdupois ounces of water are contained in a pipe four inches diameter and twenty-five feet long?

Against 20 I find 109.24 and
Against 5 I find 27.31

$136.55 \times 4 \times 4 = 2184.$

50 oz. avoirdupois.

The wine gallon contains 231 cubic inches, and the new imperial gallon 277.274 cubic inches; therefore, to reduce the wine to the imperial gallon, divide by 1.20032. This number is obtained by dividing the cubic inches in the imperial gallon by the cubic inches in the wine gallon—thus $277.274 \div 231 = 1.20032$; and for a like reduction in the ale gallon, which contains 282 cubic inches, divide by 0.98324—obtained thus $277.274 \div 282 = 0.98324$. The ale and wine gallon may be reduced to dry measure by a similar process.

Jan. 22, 1835. A.

Inquiry into the Penitentiary of Philadelphia.* (*October*, 1831.)

No. 28.—This prisoner knows how to read and write; has been convicted of murder; says his health, without being bad, is not so good as when he was free; denies strongly having committed the crime for which he was convicted; confesses to have been a drunkard, turbulent, and irreligious. But now, he adds, his mind is changed; he finds a kind of pleasure in solitude, and is only tormented by the desire of seeing once more his family, and of giving a moral and Christian education to his children—a thing which he never had thought of when free.

Ques. Do you believe you could live here without labor?

Ans. Labor seems to me absolutely necessary for existence; I believe I should die without it.

Ques. Do you often see the wardens?

Ans. About six times a day.

Ques. Is it a consolation to see them?

Ans. Yes sir; it is with joy I see their figures. This summer a cricket entered my yard; it looked to me like a companion. If a butterfly, or any other animal enters my cell, I never do it any harm.

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* Nobody is allowed to see the convicts, except the inspectors, the wardens, and the chaplain. [There are some few others, who are official visiters.—Trans.] The Philadelphia magistrates were kind enough to make an exception of the rule in favor of us. We were introduced into all the cells, and left alone with the prisoners. It is the result of a fortnight's observation, which we offer above to the reader. The number at the head of each article indicates the place which the prisoner holds in the list, as to the time of his imprisonment in the penitentiary. We have often omitted to note it down, as the reader will find.

No. 36.—The prisoner had suffered previously a punishment in the Walnut street prison; says he prefers imprisonment in the penitentiary, to the old prison. His health is excellent, and solitude does not seem to him insupportable. Asked whether he is obliged to work; he says no; but adds, labor must be regarded as a great benefit. Sunday seems interminably long, because then he is not allowed to work.

Ques. What is, in your opinion, the principal advantage of the new system, to which you are subject?

Ans. Here the prisoner does not know any of his companions, and is not known by them. It was a prison acquaintance, who, after I had left Walnut street, again involved me in a theft.

Ques. Have you sufficient to eat?

Ans. Yes sir.

Ques. Do you believe the yard belonging to your cell, is necessary for it?

Ans. I am convinced it would be impossible to do without it.

No. 41.—A young man; confesses to being a criminal; sheds tears during our whole conversation, particularly when he is reminded of his family. "Happily," says he, "nobody can see me here;" he hopes then to return into society, without being stamped with shame, and not to be rejected by it.

Ques. Do you find it difficult to endure solitude?

Ans. Ah! sir, it is the most horrid punishment that can be imagined!

Ques. Does your health suffer by it?

Ans. No: it is very good; but my soul is very sick.

Ques. Of what do you think most?

Ans. Of religion; religious ideas are my greatest consolation.

Ques. Do you see now and then a minister?

Ans. Yes, every Sunday.

Ques. Do you like to converse with him?

Ans. It is a great happiness to be allowed to talk to him. Last Sunday he was a whole hour with me; he promised to bring me to-morrow, news from my father and mother. I hope they are alive; for a whole year, I have not heard of them.

Ques. Do you think labor an alleviation of your situation?

Ans. It would be impossible to live here without labor. Sunday is a very long day, I assure you.

Ques. Do you believe your little yard might be dispensed with, without injury to your health?

Ans. Yes, by establishing in a cell a continued current of air.

Ques. What idea have you formed of the utility of the system to which you are subject?

Ans. If there is any system which can make men reflect and reform, it is this.

No. 56.—Has been convicted three times; has a feeble constitution; has not been well during the first months of his stay in the penitentiary, which he attributes to want of exercise, and sufficient current of air. He has been brought to the penitentiary at his own request; he loves, he says, solitude; he wishes to lose sight of his former companions, and form no new ones: shows his Bible, and assures us that he draws his greatest consolation from this book.

Ques. You work here without reluctance; you have said to me that this was not the case in the other prisons, in which you have been imprisoned; what is the cause of this difference?

Ans. Labor is here a pleasure; it would be a great aggravation of our evils, should we ever be deprived of it. I believe, however, that forced to do it, I might dispense with it.

No. 46.—Is fifty-two years old; was sentenced for burglary; enjoys good health; solitude seems to him a punishment extremely hard; the presence of the keepers even, is a great satisfaction for him, and he would consider it a happy event, if a minister would sometimes visit him; considers labor his greatest consolation. He denies having committed the crime which caused his conviction.

No. 61.—Was convicted for horse-stealing; says he is innocent. Nobody, he says, can imagine the horrid punishment of continued solitude. Asked how he passes his time; he says there are but two means—labor, and the Bible. The Bible is his greatest consolation. He seems to be strongly actuated by religious ideas; his conversation is animated; he cannot speak long without being agitated, and shedding tears. (We have made the same remark of all, whom we have seen so far.) He is a German by birth; lost his father early, and has been badly educated. Has been above a year in the prison. Health good. According to him, the adjacent yard is abso-

lutely necessary for the health of the prisoner.

No. 83.—Thirty years of age; is in a state of relapse. In Baltimore, where he was detained, the discipline was very hard, and the daily task of labor very considerable.

Ques. Do you prefer being imprisoned here?

Ans. No; I should prefer to return to Baltimore, because there is no solitude there.

He has been but two months here; has had the fever; but his health is entirely restored.

No. 22.—A negro of thirty-four years; has been convicted for theft once before; eighteen months here; health pretty good.

Ques. Do you find the discipline to which you are subject, as severe as it is represented?

Ans. No; but that depends upon the disposition of the prisoner. If he takes solitary confinement bad, he falls into irritation and despair; if, on the contrary, he immediately sees the advantages which he can derive from it, it does not appear insupportable.

Ques. You have been imprisoned already in Walnut street?

Ans. Yes sir; and I cannot imagine a greater den of vice and crime. It requires but a few days, for a person not very guilty, to become a consummate criminal.

Ques. Do you think that the penitentiary is superior to the old prison?

Ans. That is as if you were to ask me, whether the sun was finer than the moon?*

No. 68.—Age twenty-three; convicted of theft; has been here six months; health excellent; he is cold, and little communicative; he only becomes animated by speaking of the sufferings of solitude; he works with ardor; the presence of a visiter never interrupts his labor.

No. 85.—Has been here two months; convicted of theft. Health good, but his mind seems to be very agitated. If you speak of his wife and child, he weeps bitterly. In short the impression produced by the prison, seems very deep.

No. 52.—Age thirty-nine; is in a state of relapse; has been formerly in Walnut street; says that that prison is a shocking place; one cannot leave it honest. If I had been, he says, at first in this penitentiary, I should not have committed a second crime.

Ques. Have you accustomed yourself easily to solitude?

Ans. At first, solitude seemed to me horrid: gradually I accustomed myself to it; but I do not believe I could live here without labor. Without labor, there is no sleep.

This person has been nearly a year in this prison; enjoys good health.

No. 50.—Thirty-seven years old; in relapse; paints energetically the vices which prevail in Walnut street, where he has been imprisoned.

If they had put me here for my first crime, he said, I should never have committed a second; but one always leaves Walnut street worse than he enters it. Nowhere but here, is it possible to reflect.

Ques. But the discipline of this penitentiary is very severe?

Ans. Yes sir; particularly in the beginning. During the two first months, I was near falling into despair. But reading and labor have gradually comforted me.

This prisoner has been twenty months here. Health excellent.

No. 62.—A well educated man, thirty-two years old. He was a physician.

Solitary confinement seems to have made a profound impression upon this young man. He speaks of the first time of his imprisonment with horror; the remembrance makes him weep. During two months, he says, he was in despair; but time has alleviated his situation. At present, he is resigned to his fate, however austere it may be. He was allowed to do nothing; but idleness is so horrid, that nevertheless he always works. As he knew no mechanic art, he occupies himself with cutting leather for the shoemakers in the prison. His greatest grief is not to be allowed to communicate with his family. He ended the conversation by saying: Solitary confinement is very painful, but I nevertheless consider it as an institution eminently useful for society.

Health good. He does not complain of the physical part of the discipline to which he is subject.

The foregoing extracts from the investigations of M. de Beaumont and M. de Toqueville, the French commissioners, will go far, we trust, to convince those who doubt the superior efficacy of *solitary confinement without labor*, of its lasting and useful effect on the great majority of the inmates of State-prisons. Although we would have every one to draw his own conclusion from the facts, we cannot omit to call attention to the remarks of No. 62, an educated and intelligent man, whose opinion is good evidence in the case.—[Ed. M. M.]

* We believed it necessary to give literally the answers of the prisoners.